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# In Practice

## **Pseudomonas otitis in dogs: a GP's guide to treatment**

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1 Pseudomonas otitis in dogs: a GP’s guide to treatment

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3 Biographies

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9 **Competing interests** – Over the past five years you have lectured for Zoetis and Elanco.

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11 fellow in veterinary dermatology and pathology at the University of Bristol.

12 **Competing interests** – none declared.

13 SUMMARY

14 This article will cover an approach to the management of canine *Pseudomonas* otitis. It aims to  
15 provide a practical approach to the management and investigation of these challenging cases.  
16 The aetiology of otitis including predisposing, primary, secondary and perpetuating factors will  
17 be discussed. Diagnostic tests including cytology samples and swabs for culture and sensitivity  
18 will be discussed, as will interpretation of your results. Treatment of otitis externa and otitis  
19 media cases will be covered detailing the advantages and disadvantages of various systemic  
20 and topical treatments and when each is appropriate.

21 INTRODUCTION

22 Otitis externa in dogs is a very common clinical problem encountered in general practice; it is  
23 also a very frustrating one to treat especially when cases are recurrent. Many organisms can be  
24 implicated in cases of otitis including Gram-positive cocci, Gram-negative rods such as  
25 *Pseudomonas* and the yeast *Malassezia pachydermatis*. This article will focus on the  
26 investigation and treatment of cases of *Pseudomonas* otitis.

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2  
3 27 *Pseudomonas spp.* are ubiquitous Gram-negative bacilli, which occur widely in water, soil and  
4  
5 28 decaying organic matter. They are transient organisms of the canine skin and opportunistic  
6  
7 29 invaders on pathological processes such as otitis. *Pseudomonas aeruginosa* is the most common  
8  
9 30 Gram-negative isolate in cases of canine otitis. This bacterium is a particular problem in cases  
10  
11 31 of otitis because the strains involved can be resistant to antibacterial drug treatment (Cole and  
12  
13 32 others 1998). *Pseudomonas* organisms have a complex array of virulence factors and resistance  
14  
15 33 mechanisms that make them a substantial challenge in human and veterinary medicine  
16  
17 34 (Alhamzi 2014).

## 18 19 35 AETIOLOGY

20  
21 36 The causes of otitis can be classified into predisposing, perpetuating, primary and secondary  
22  
23 37 factors (Table 1). In chronic cases of otitis it important to recognise that more than one of these  
24  
25 38 factors may be present and contributing to the patient's disease. It is vital when dealing with  
26  
27 39 cases of otitis externa/media that these factors are addressed to prevent a recurrence of the  
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29 40 condition and to aid resolution of the otitis.

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32 41 Otitis externa if not treated appropriately can progress into chronic disease. It is this prolonged  
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34 42 inflammation of the ear canal which then modifies the microenvironment within the ear and  
35  
36 43 leads to a change in the bacterial population, which in turn causes changes to the structure of  
37  
38 44 the ear canal such as stenosis and glandular hyperplasia leading to increased cerumen  
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40 45 production. This in conjunction with the prolonged use of topical antibacterial treatment can  
41  
42 46 lead to the development of a bacterial population with a less predictable sensitivity pattern such  
43  
44 47 as *Pseudomonas*. It is beyond the scope of this article to discuss in depth the aetiology of otitis  
45  
46 48 and readers are referred to standard dermatology texts (Harvey & Paterson 2014; Paterson  
47  
48 49 2016).

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50  
51 50 *Pseudomonas* is a Gram negative rod that is not usually isolated from normal dog's ears; it can  
52  
53 51 account for up to 35% of cases of otitis externa and or media (Cole and others 1998).  
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HISTORY & CLINICAL SIGNS

Dogs suffering with otitis caused by *Pseudomonas* sp. will often present with an acute onset painful ear with a large amount of purulent exudate, one or both ears can be affected. Often the ear canal may be ulcerated. Ulceration is not commonly seen in cases of otitis caused by yeast organisms. When the condition is chronic you may also see lichenification, hyperpigmentation and excoriation of the pinna; it may not always be immediately apparent from the initial examination that *Pseudomonas* infection is present (Figures 1 to 6). Otoscopy may not be possible without sedation or anaesthesia due to pain caused by otitis. Other clinical signs that may be seen or reported include:

- Head shaking
- Odour
- Head tilt
- Pain when opening the mouth or swallowing
- There may be other signs of skin disease, such as pedal pruritus, saliva staining of the feet, history of recurrent pyoderma
- Vestibular signs – seen in some cases of otitis media
- Loss of hearing

General physical examination

This should be performed in all cases. Lymphadenopathy may be present and it is important to check for any neurological deficits (head tilt, facial paralysis, nystagmus etc.) in cases where otitis media is suspected.

Dermatological examination

Examine the whole patient as you may find evidence of more generalised skin disease. Atopic dermatitis is a common cause of recurrent otitis (Jaeger and others 2010) and many animals with ear disease do have signs of generalised pruritus when examined closely. Identifying these signs gives important clues as to the primary factor which needs to be controlled to prevent a recurrence of the otitis.

## 79 DIAGNOSTIC TESTS

### 80 Cytology

81 In the authors' opinion cytology is vital and should be performed in all cases of otitis externa. It  
82 is often better tolerated than otoscopy and so it is the author's preference to perform this prior  
83 to examining the ear with an otoscope. By examining an ear cytology sample we can determine  
84 what type of organisms (coccoid bacteria, rod shaped bacteria or *Malassezia*) are present in the  
85 ear. This enables us to make a more rational treatment plan, decide when to send a swab for  
86 culture and also helps to follow up treatment.

87 Ideally ear cleaner and or medication is not applied to the ear canal on the day that a sample is  
88 taken for cytology or culture.

89 See (BOX 1) for details on how to perform this procedure.

### 90 Otoscopy

91 This can be very challenging to perform conscious in cases with very painful ears. Often  
92 sedation or anaesthesia is required. If the animal will not tolerate this procedure then we should  
93 question what we are hoping to achieve from examining an ear that is full of a purulent  
94 exudate. Sometimes re-assessing the patient after a few days treatment with prednisolone for  
95 otoscopy is also good treatment option and may avoid the need for sedation.

96 Otoscopy is often performed with a view to visualising the tympanic membrane as this may  
97 affect treatment options. However it is accepted that it is very difficult to assess the integrity of  
98 the tympanic membrane in cases of otitis without first cleaning the ear and the patient being  
99 heavily sedated or anaesthetised. Many of our patients are very fearful of ear examination  
100 because it has been an unpleasant experience. We should work hard not to make this the case  
101 if possible as ultimately it will make ear examination an easier experience for all concerned  
102 especially when dealing with atopic dogs who may need long term ear treatment. The use of  
103 treats during otoscopy is a good way to distract the patient and may enable easier examination  
104 and make it a more pleasant experience for the dog and owner.

Culture and sensitivity

Swabs should be sent for culture and sensitivity whenever rods are seen on cytology as this could indicate a *Pseudomonas* infection. Generally it is best to treat the suspected cases as if they have a *Pseudomonas* infection when rods are seen on cytology, while awaiting results, as this is often the best chance to resolve the infection.

TEXT BOX 1: Interpreting culture and sensitivity results

It is important to remember that bacterial culture sensitivity reports are based on the amount of antibacterial drug in serum concentrations required to kill the organism. This has implications when selecting a systemic treatment to deal with a case of otitis media, but may not be relevant when using topical treatments, because these are applied to the ear in much greater concentrations than those tested and still may be effective especially when their use is combined with a product like Tris-EDTA.

See Nuttall 2016 for a more detailed appraisal of how to interpret test results.

It is important to remember that in the majority of cases of otitis externa and media topical treatment is the treatment of choice.

TREATMENT

Once a *Pseudomonas* otitis externa/media has been identified it should be treated aggressively and the owners should be warned that treatment can in some cases be lengthy and require several follow up appointments to check on progress. In some chronic cases it is not unusual for treatment to take 6 – 8 weeks with frequent revisits every two weeks to monitor the patient’s progress. When discussing the treatment options with a client it is important to take into consideration client and patient factors. For example financial considerations, can the owner actually medicate the dogs ear (?), are the clients committed to make frequent revisits? In the authors’ opinion the success of managing these cases especially when they are chronic is largely influenced by the owner’s commitment and dedication to medical management which can be time consuming and labour intensive.

To date the quality and quantity of studies that have been performed to evaluate treatments for *Pseudomonas* otitis are low and so most therapeutic decisions are based on inadequate published data, personal experience and anecdote, rather than on a solid evidence base (Nuttall & Cole 2007) This should be borne in mind when reading this and other articles.

The aims of treatment are:

- 1) Eliminate the *Pseudomonas*
  - 2) Reduce the inflammation present in the ear canal and therefore prevent the production of further exudate
  - 3) Clean the ear – to remove the mucopurulent exudate
  - 4) Prevent a recurrence by addressing any primary, predisposing and perpetuating factors.
- This includes reversing any chronic changes if possible to change the environment in the ear canal so it is not supportive for the *Pseudomonas* bacterium.

## 1 ELIMINATE THE *PSEUDOMONAS* ORGANISM

Our main aim is to eliminate the *Pseudomonas* bacterium which is causing the infection. Topical treatment for these cases remains the treatment of choice due to the poor blood supply to the ear canal and therefore relatively low amounts of antibacterial drug that actually reach the ear when it is given parentally. However the exception to this rule is when cases have neurological signs associated with their otitis media. In these cases topical treatment should generally be avoided if possible because it may exacerbate the neurological signs.

### *What's available to eliminate the *Pseudomonas*?*

There are two main categories of treatments available, namely antibacterial drugs and antiseptics.

#### ANTIBACTERIAL DRUGS

The following drugs are available in current topical ear products in the U.K. and would be suitable to treat cases of *Pseudomonas* otitis:

- Marbofloxacin (Aurizon®: Vetoquinol, Marbodex®: Norbrook Laboratories)
- Orbifloxacin (Posatex®: MSD)



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- 160 • Gentamicin (Otomax®; MSD, Easotic®; Virbac)
- 161 • Polymixin B (Surolan®; Elanco)

162 It should be noted that none of these products are licensed to be used in an ear when the  
163 tympanic membrane is ruptured. See below for details of managing cases of otitis media.

164 Fluoroquinolones such as enrofloxacin, marbofloxacin and pradofloxacin and are commonly used  
165 in veterinary medicine in the U.K, but should generally be reserved for the more resistant  
166 infections. They are bactericidal and inhibit the bacterial gyrase enzyme responsible for DNA  
167 synthesis. The bactericidal activity of the fluoroquinolones is concentration dependent and this  
168 makes them a good choice for topical treatment of cases of *Pseudomonas* otitis. Their action  
169 can be potentiated by using a Tris-EDTA containing product prior to applying the medication.

170 Some studies when using these drugs orally to manage cases of *Pseudomonas* otitis that off  
171 label higher dose rates have been more effective, but as discussed generally topical treatment  
172 is preferred and more effective.

173 Polymixin B should be effective in managing cases of *Pseudomonas* otitis, however in the  
174 authors' experience in the U.K, success with this treatment seems to be fairly limited, many  
175 isolates appear to be resistant to this treatment and there are no current, accepted, guidelines  
176 for assessing the antibacterial resistance of veterinary isolates of *Pseudomonas* (laboratory  
177 recommendations are usually based on guidelines for the interpretation of results for human  
178 isolates).

179 Aminoglycosides such as gentamicin and tobramycin are reported to be effective against  
180 *Pseudomonas* isolates and can be used as topical therapy in these cases. These antibacterial  
181 agents exert their action by inhibiting bacterial protein synthesis. Their action is optimal in an  
182 alkaline environment and they can be inactivated by purulent material, so will work best in a  
183 clean ear. Using these agents in combination with a product containing Tris-EDTA will potentiate  
184 their action. Otitotoxicity is often a concern when using these medications especially gentamicin. It  
185 should be noted that ototoxicity from topical gentamicin did not occur in any dogs after  
186 deliberate rupture of the tympanic membrane (Strain and others 1995).

## 187 ANTISEPTICS

188 Benefits have been reported when using a product containing acetic acid and boric acid  
189 (Malacetic®; Dechra) as a soak in affected ears. Generally, given that the ear canals are  
190 ulcerated and painful this sort of product should be applied in a heavily sedated or  
191 anaesthetised patient.

## 192 Tris-EDTA (TRizAural®; Dechra)

193 This product contains Tris-EDTA in alkaline solution. This can be very useful when treating cases  
194 of *Pseudomonas* otitis. It affects the cell membranes of the bacterium by chelating minerals  
195 such as calcium and magnesium, essentially stripping off the outer membrane layer, rendering  
196 the membranes more porous so that antibacterial drugs can diffuse into the bacteria and kill  
197 them. This may also indirectly interfere with the efflux pump mechanism by chelating the  
198 calcium ions required for the pump mechanisms.

199 Even if culture and sensitivity indicate that a Gram-negative bacterium is resistant in vitro to a  
200 certain antibiotic, pre-treatment with Tris-EDTA may make the organism sensitive to the  
201 antibiotic in vivo. Clinically this product should be used as a pre-treatment solution 20 to 30  
202 minutes prior to applying topical antibiotic treatment. It is most effective when used in  
203 combination with fluoroquinolones and gentamicin (Buckley and others 2013).

## 204 Silver sulphadiazine (Flamazine cream®: Smith and Nephew)

205 This product is a human topical agent used to treat patients with burns and is not licensed for  
206 use in animals in the U.K. Silver sulphadiazine is active in vitro against *Pseudomonas*  
207 *aeruginosa* and a 1% preparation has been reported to be useful when treating some cases of  
208 *Pseudomonas* otitis. In the UK this product is available as a cream and should be mixed with  
209 saline to make a suspension which can then be used topically in the ear. This has not been  
210 found to be ototoxic and so can be used in cases of otitis media. It is suggested to mix 1.5 mls  
211 with 13.5 mls of saline, which is then mixed well to make a uniform suspension (Foster &  
212 DeBoer 1998). Generally 1-2 mls would be applied to the affected ear twice daily. When giving

213 this mixture to clients it must be stressed to mix the suspension well before applying it to the  
214 patient.

215 What to use if the tympanic membrane is ruptured?

216 Otitis media is extremely common in cases of *Pseudomonas* otitis and so this is a common  
217 therapeutic dilemma. Imaging of the ear is useful to identify if otitis media is present, but  
218 unfortunately radiographs are quite insensitive at detecting changes in the bulla and generally a  
219 CT Scan or MRI will be more sensitive. Pathological abnormalities of the tympanic bulla and  
220 external ear canal seen using the various imaging modalities can be a prognostic indicator in  
221 some cases; i.e. it may reflect that those cases could be more difficult to manage medically and  
222 possibly surgical management should be considered. There are currently no topical products  
223 licensed to treat otitis media in the dog, although it is still accepted that topical treatment is the  
224 best way to manage these cases, providing they do not have any neurological signs. If  
225 neurological signs are present, with the exception of flushing the ear with saline, systemic  
226 treatment is preferred (see box on systemic treatment).

228 There are many different treatments proposed in the literature for dealing with these cases  
229 ranging from the use of acetic acid flushes to using injectable fluoroquinolone solutions  
230 topically. Each case should be treated as an individual. Discussing cases with an experienced  
231 clinician, who is used to dealing with these cases, such as a RCVS specialist in veterinary  
232 dermatology, may be useful. Below are some suggested treatments that can be used when the  
233 tympanic membrane is ruptured. Please be aware that these products are being used off  
234 licence, including the use of some drugs employed in human medicine, clients should be warned  
235 of possible adverse effects before using them and sign a consent form for off-label use.  
236 Whenever off license treatments are used to treat otitis media cases should be regularly  
237 monitored and clients advised to discontinue treatment and contact the practice if there are any  
238 problems, specifically neurological side effects.

- 239 • Injectable enrofloxacin solution (Baytril®; Bayer 2.5%): water for injection in a 1 : 4  
240 ratio. This is the author's preferred way to use this product, however in the literature

various different ratios and combinations are used. Ideally instil 0.5-1 ml of the solution into the dog's ear twice daily.

- Gentacin® eye/ear drops – this is a human product which can be used topically in the ears.
- Flamazine® suspension – as described above.
- TRizAural flushes – have been used in cases where the tympanic membrane is ruptured.
- Ticarcillin has been successfully used in these cases, it is no longer available.
- In cases with a ruptured tympanic membrane if you feel topical glucocorticoid would be beneficial dexamethasone sodium sulphate injectable (Rapidexon; Dexadresson) can be diluted 1:1 with water for injection or saline and a volume of 0.25-0.5 ml can be instilled into the ear after flushing (Harvey & Paterson 2014).

#### TEXT BOX 2 Systemic treatment of otitis media

Systemic treatment is generally only used when there are neurological signs or topical treatment is not possible. In these cases your culture and sensitivity results become very important because if we use systemic antibiotics alone in cases of otitis media it relies on lower level of antibacterial agents reaching the middle ear through the blood stream or inflammatory cells. Fluoroquinolones such as enrofloxacin and marbofloxacin are suitable to treat cases of otitis media, but even at the maximal doses may not be high enough to deal with very resistant infections.

Topical treatment for otitis media is still the preferred way to treat these cases, because of the high level of drug that can be used topically and the relatively poor drainage of the ear canal.

## 2 REDUCING INFLAMMATION

The best way to reduce inflammation in cases of otitis is to use glucocorticoids these can be used both topically and systemically. The author will use systemic glucocorticoids in most cases of *Pseudomonas* otitis. Systemic glucocorticoids, reduce both intense pruritus, inflammation and ulceration of the ear canal. Doses typically used range from 0.5-1 mg/kg once daily for a minimum of 10-14 days to reduce the stenosis and oedema of the external ear canal. Topical

corticosteroids are also very useful when managing these cases. Most of the commercial ear drops contain a topical corticosteroid with variable potency.

Below is a table showing the types of steroids included in current topical ear preparations and their relative potency compared to hydrocortisone which is given a potency of 1.

STEROID	POTENCY	PRODUCT
Prednisolone	4	Surolan®, Canaural®
Dexamethasone	25	Aurizon®, Marbodex®
Betamethasone	25	Otomax®
Hydrocortisone aceponate*	>25	Easotic®
Mometasone *	>25	Posatex®

\* Mometasone and hydrocortisone aceponate are considered to be more potent steroids than betamethasone and dexamethasone.

ANALGESIA

Using steroids will reduce the inflammation present in the ear canal but it is not an analgesic. Non-steroidal anti-inflammatories do not clinically seem to be very effective at managing pain in these patients and obviously should not be given with glucocorticoids; often opiate-based analgesics are used if required. If your patient is very painful you may want to consider using Tramadol (2-5 mg/kg three times daily) or paracetamol- codeine (PARDALE-V) for analgesia.

3 EAR CLEANING

Ear cleaning is vitally important when dealing with these cases as we are aware that removal of the mucopurulent exudate will enhance the effectiveness of some antibacterial treatments such as gentamicin and polymixin B. However we do need to be careful not to over clean the ear because this will cause irritation and maceration of the ear canal and make the infection harder to resolve. There are many ear cleaning products on the market and most have a good antibacterial action. It is beyond the scope of this article to discuss ear cleaners in detail. Below are some general rules:

289

290 • An ear flush under general anaesthesia is a good way to remove a large amount of  
291 debris and also allows assessment of the tympanic membrane. Generally we would  
292 advise ear flushing in most cases of *Pseudomonas otitis*. (box 2).

293 • Limit the use of ear cleaners daily to 14 days and then reduce the frequency to 1 -2  
294 times weekly as this will prevent maceration of the ear canal epithelium.

295 • Be aware of contact reactions with ear cleaners and consider changing products if the  
296 dog is not tolerating the ear cleaner or the owner reports excessive discomfort shortly  
297 after using them.

298 • When selecting an ear cleaner, consider the pH of the product you are using. For  
299 example if a dogs ear canal is very ulcerated then a very acidic or alkaline cleaner may  
300 cause a lot of discomfort in the early stages of treatment.

#### 301 4 IDENTIFY & MANAGE THE PRIMARY FACTOR/S THAT CAUSED THE PROBLEM

302 It is important to identify the primary, perpetuating and predisposing factors in every case and  
303 ensure that all factors are addressed to prevent a recurrence of the problem. In recurrent cases  
304 of otitis an allergy investigation should be considered including a dietary trial.

#### 305 **Potential problems when treating cases of *Pseudomonas otitis***

##### 306 • **Managing owners expectations**

307 ○ Advise at the beginning of treatment if *Pseudomonas* is isolated and the problem has  
308 been going on for some time it may take at least 6 – 8 weeks of treatment to  
309 resolve the problem

310 ○ Advise them at the start if ear disease has been a recurrent problem that  
311 investigating the underlying cause will be essential to preventing relapses in the  
312 future.

##### 313 • **Owner compliance**

314 ○ Consider using a syringe to apply medication to the ear to enhance owner  
315 compliance. Patients seem to readily tolerate medication being applied in this way.

- Always demonstrate the use of ear cleaners to clients and also demonstrate how to apply ear drops.
- **Infection recurs when treatment is discontinued**
  - Most commonly this occurs because treatment is stopped too early, always aim to treat for at least 7 – 10 days past cytological cure and then re-assess the patient 7-10 days after discontinuing the antibiotic treatment.
  - Primary, predisposing and perpetuating factors may not have been adequately addressed.
  - Often ear cleaning will need to be continued for many months to allow the normal cleaning mechanisms of the ear to recover. If the infection has been particularly severe or prolonged then ear cleaning may need to be continued indefinitely.

**FOLLOWING UP THE CASES AND ON GOING MANAGEMENT**

In the authors opinion these cases should be re-examined every 10-14 days and cytology repeated at each visit. Owners will often report the dog is completely recovered, but without repeating cytology and otoscopy it is impossible to judge when treatment can be stopped. It is not uncommon for *Malassezia* to be seen on cytology samples at revisit examinations, generally the authors consider this to be a good sign and recovery of the normal flora, but excessive numbers may need to be controlled with appropriate treatment.

**When to consider surgery as a treatment option?**

Surgical intervention such as a total ear canal ablation and bulla osteotomy should be considered when:

- Medical treatment fails
- When medical treatment is not possible due to client or patient factors; i.e. the client is unable to apply topical medication, financial limitations.
- There are severe secondary changes to the ear canal making medical management difficult or unlikely to succeed such as calcification of the external ear canal or chronic otitis media with structural changes to the bulla.

## SUMMARY

*Pseudomonas* otitis is perhaps the most challenging infection of the ear to manage, because it is intrinsically resistant to many antimicrobial drugs and it thrives in an environment created by chronic inflammatory changes in the ear canal. It is important in these cases that we treat them aggressively at first presentation and address any predisposing, primary, secondary or perpetuating factors that may be present. Successful management of these cases is easier with a dedicated owner and regular re-examinations are vital.

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47 389 *Veterinary Research* **56**, 532-538.

51  
52 390 **TABLE 1 Predisposing, primary, secondary and perpetuating factors for otitis**  
53  
54 391 **Predisposing factors** – these make the chance of developing otitis externa more likely by  
55 392 changing the environment in the ear canal, but alone will not cause otitis externa. These are  
56 393 explored in more detail elsewhere (Paterson 2016). Examples include:

- 394 • Conformation – e.g. pendulous ear canals, hairy ear canals, stenotic ear canals (occur
- 395 naturally in some breeds such as the Shar Pei)
- 396 • Excessive moisture in the ear – as a result of swimming, excessive use of ear cleaners
- 397 • Inappropriate treatment – which may traumatise the ear canal

398 **Primary factors** – these factors can directly cause otitis externa

- 399 • Ectoparasites – *Otodectes*, demodicosis.
- 400 • Foreign bodies – grass seed
- 401 • Allergic skin disease (adverse food reaction, atopic dermatitis).
- 402     ◦ **Atopic dermatitis is the most common cause of otitis externa in the dog**
- 403 • Endocrinopathies - hyperadrenocorticism and hypothyroidism
- 404 • Immune-mediated disease – e.g. pemphigus foliaceus, juvenile cellulitis
- 405 • Keratinisation defects – e.g. sebaceous adenitis
- 406 • Immunosuppression – possible secondary to neoplasia or chemotherapy
- 407 • Neoplasia within the ear canal

408 **Secondary factors** – these factors contribute to or cause pathology in an abnormal ear, but

409 will not create disease in normal ears, examples include yeast and bacterial overgrowth.

410 **Perpetuating factors** – these are the changes (anatomically or physiologically) that occur in

411 an ear when chronic otitis is present and make it harder to manage medically. Examples

412 include:

- |                                 |   |
|---------------------------------|---|
| 413 • Stenosis of the ear canal | 415 • Epidermal and glandular hyperplasia |
| 414 • Ulceration                | 416 • Otitis media                        |

#### 417 Box 1: How to perform ear cytology

418 See three figures entitled Ear cytology – cocci; Ear cytology – Malassezia and Ear cytology – rods

#### 419 Equipment required

- |                        |                                      |
|------------------------|--------------------------------------|
| 420 • cotton buds x 2  | 422 • pencil – to label your slides  |
| 421 • glass slides x 2 | 423 • Diff Quik® or equivalent stain |

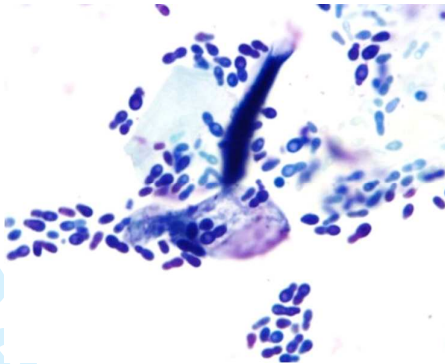
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- 424
- Microscope with immersion oil lens
- 425
- Immersion oil

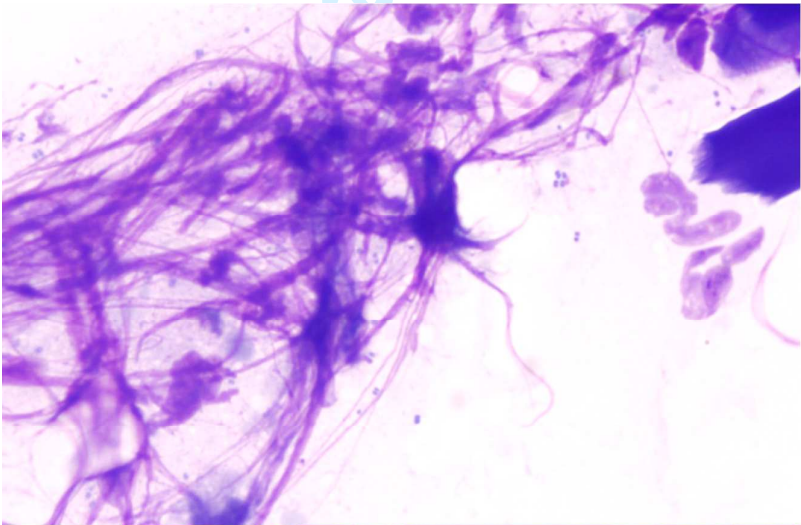
**Taking the sample**

- 427
1. Ensure the dog is relaxed and use treats if needed to obtain the sample.
- 428
2. Carefully place the cotton bud into the dog’s external ear canal if possible try to obtain a
- 429
- sample from the horizontal portion of the external ear canal. If the ear is painful or
- 430
- stenotic you may only be able to sample the vertical canal.
- 431
3. Remove the cotton bud from the dog’s ear and then gently roll it on a glass slide. Label
- 432
- the slide. Stain the sample using Diff Quik, rinse and allow it to dry.
- 433
4. Once the slide is dry you can examine it using a microscope. Initially select an area of
- 434
- interest using low power and then use the oil immersion lens to try and identify
- 435
- inflammatory cells and organisms. Examples of findings are shown below:

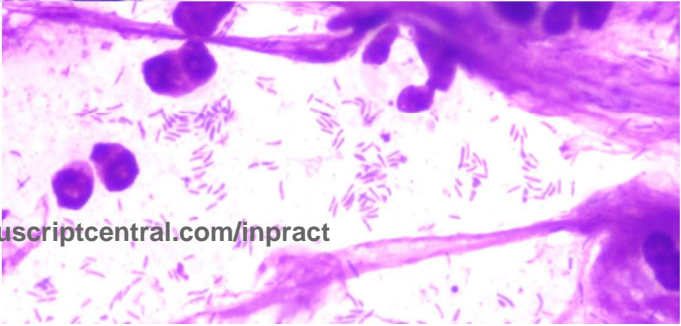
*Malassezia pachydermatis* is shown. Note the distinctive shape of the organism often referred to as a foot print or snowman when described. These organisms are much larger than bacteria.



Coccoid bacteria<sup>440</sup> with numerous neutrophils and<sup>441</sup> nuclear streaming.



Rod shaped bacteria with numerous neutrophils and nuclear streaming



BOX 2: Ear flushing See figures entitled Ear Flush 1 to 5

## Ear Flushing

If an ear canal is full of a purulent or ceruminous exudate it is not possible to assess the integrity of the tympanic membrane, which can be very important when managing a case of *Pseudomonas* otitis. Flushing of the ear canal should be performed under general anaesthesia. In some referral hospitals a video otoscope is used, which enhances visualisation, but in practice you may not have access to this equipment and so here is one technique you can use to flush the ears. Ear flushing is generally time consuming and you should allow approximately 20-30 minutes to flush each ear.

Prior to admitting the patient for an ear flush it is often beneficial for them to have received treatment with a glucocorticoid to reduce the inflammation present and open up the ear canal. The author routinely prescribes prednisolone at 0.5 mg/kg once daily for at least 7 days prior to an ear flush.

### *Equipment required for ear flushing*

- 500 ml bag of sterile saline
- Otoscope with two suitable sized heads
- Syringes – 2 and 5 mls
- Appropriate sized catheter to flush the ear depending on the patency of the ear canal. Cat or dog urinary catheters can be used. The author prefers to use 6F dog catheters. These should then be cut to an appropriate length depending on the size of the patient and the length of their ear canal. The catheter needs to be long enough to pass through the otoscope head and into the ear canal.
- Two bowls, one for the fresh saline and one to place the fluid flushed from the affected ear.

### Performing an ear flush with a handheld otoscope

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It is important that flushing of the ear is carried out whilst visualising the ear canal so that no damage is caused to any structures in the ear.

Step 1: Examine the affected ear with an otoscope and take a sample for ear cytology if not performed already. If rods are seen on



cytology and you have not already taken a swab for bacterial culture and sensitivity you should do this prior to flushing the ear. It is useful to clip the hair away from the pinnae and external auditory meatus at this stage.

Step 2: Prepare your equipment: Take a clean 5 ml syringe and attach your pre-prepared urinary catheter cut to the appropriate length for the patient to it. Draw up 2-3 mls of saline into this syringe.

Step 3: Clean the external auditory meatus using some warm water and cotton wool.

Step 4: Introduce the otoscope into the external ear canal and once you are able to visualise as far as possible into the ear, move the lens of the otoscope out of the way to enable a catheter to be introduced into the otoscope.





Step 5: Whilst holding the otoscope and pinna in one hand, introduce the catheter into the affected ear and slowly introduce the saline, whilst looking down the ear canal. You will see the saline fill the ear canal, before it reaches the top of the ear canal, suck back all the fluid you



have introduced and then discard this in the discard bowl. This procedure is repeated until the fluid removed from the ear is clear.

**YOU WILL NOT BE ABLE TO REMOVE ALL THE FLUID INTRODUCED, BUT YOU SHOULD BE ABLE TO REMOVE MOST OF IT BECAUSE WE DO NOT WANT TO LEAVE LARGE QUANTITIES OF SALINE IN THE AFFECTED EAR.**

At this stage you should be able to visualise the external ear canal and hopefully the tympanic membrane. If the ear canal is clean and you can't see the tympanic membrane, but can see a black hole, it is likely the tympanic membrane has ruptured.

STEP 6: Dry the ear as much as possible using cotton buds and then apply your first dose of the chosen treatment.

### Figure legends

Figure 1

Mild erythema and thickening of the auditory meatus of a cocker spaniel with chronic otitis associated with *Pseudomonas* infection.

- 1
- 2
- 3 514 Figure 2
- 4
- 5 515 Severe otorrhoea in a cocker spaniel with severe otitis externa
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- 7 516 Figure 3
- 8
- 9 517 Dark brown exudate in a dog with otitis external due to Pseudomonas infection.
- 10
- 11 518 Figure 4
- 12
- 13 519 Marked stenosis in a dog with chronic otitis involving Pseudomonas infection.
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- 15 520 Figure 5
- 16
- 17 521 Marked thickening and alopecia of the pinna in a dog with chronic otitis
- 18
- 19 522 Figure 6
- 20
- 21 523 Severe ulceration and purulent exudate in a St Bernard dog that developed Pseudomonas
- 22 524 infection following inappropriate and over zealous cleaning of the ear for "canker"
- 23
- 24 525

526 MCQs

527 Q 1 Which antibacterial agent is likely to be effective against Pseudomonas isolates?

- 528 A. Doxycycline
- 529 B. Fusidic acid
- 530 C. Marbofloxacin
- 531 D. Cefalexin
- 532 E. Trimethoprim-sulfa

533 Answer C

534 Q 2 Which of the following is a primary factor that contributes to otitis?

- 535 A. Epidermal and glandular hyperplasia
- 536 B. Pendulous ear canals
- 537 C. Yeast overgrowth
- 538 D. Atopic dermatitis
- 539 E. Excessive use of ear cleaners

540 Answer D

541 Q 3 Which ear product can be applied when the tympanic membrane is ruptured?

542 A. Marbofloxacin in Aurizon® or Marbodex®

543 B. Orbifloxacin Posatex®

544 C. Gentamicin in Otomax® and Easotic®

545 D. Polymixin B in Surolan®

546 E. Tris-EDTA as TrisAural

547 Answer E

548 Q 4 When there are signs of otitis externa / media; when should topical therapies be  
549 avoided?

550 A. When there are neurological signs

551 B. When there are signs of pruritus

552 C. When there are signs of contact irritant dermatitis on application of an ear cleaner

553 D. When there are signs of dental disease

554 E. When there are signs of liver disease

555 Answer A & C

556 Q 5 When viewing a cytology sample from an ear canal in a dog with signs of otitis; any rod  
557 shaped bacteria are most likely to be?

558 A *Prevotella*

559 B *Pseudomonas*

560 C *E coli*

561 D *Pasteurella*

562 E Staphylococci

563

564 Answer B





Figure 1

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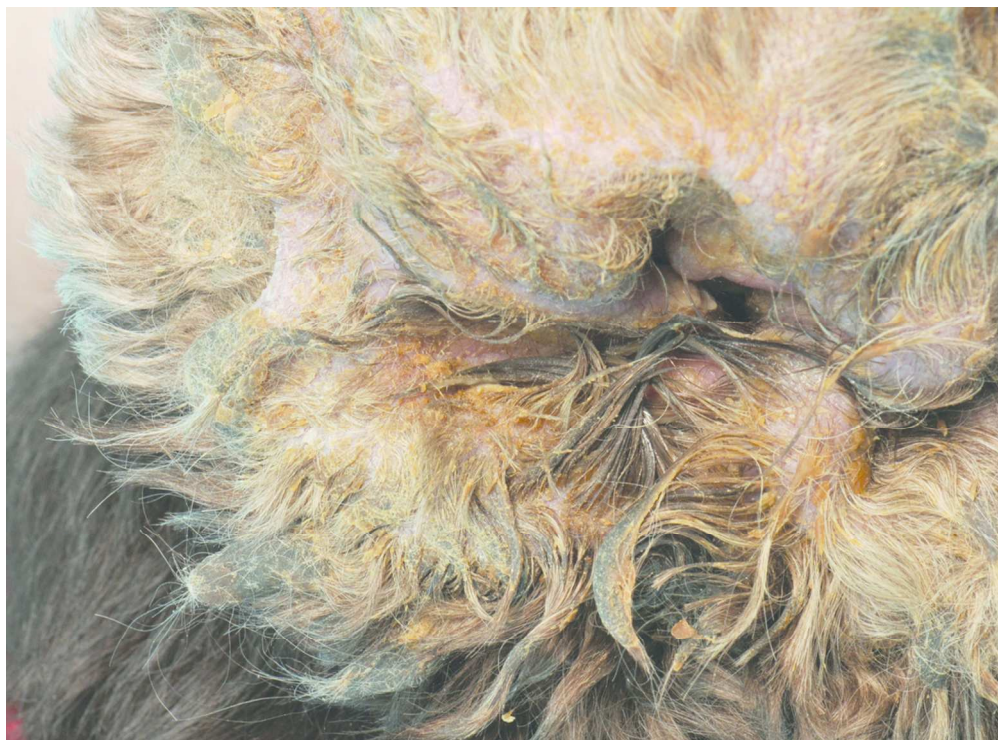


Figure 2

106x78mm (300 x 300 DPI)



Figure 3

109x82mm (300 x 300 DPI)





Figure 4

109x82mm (300 x 300 DPI)



Figure 5

150x111mm (300 x 300 DPI)

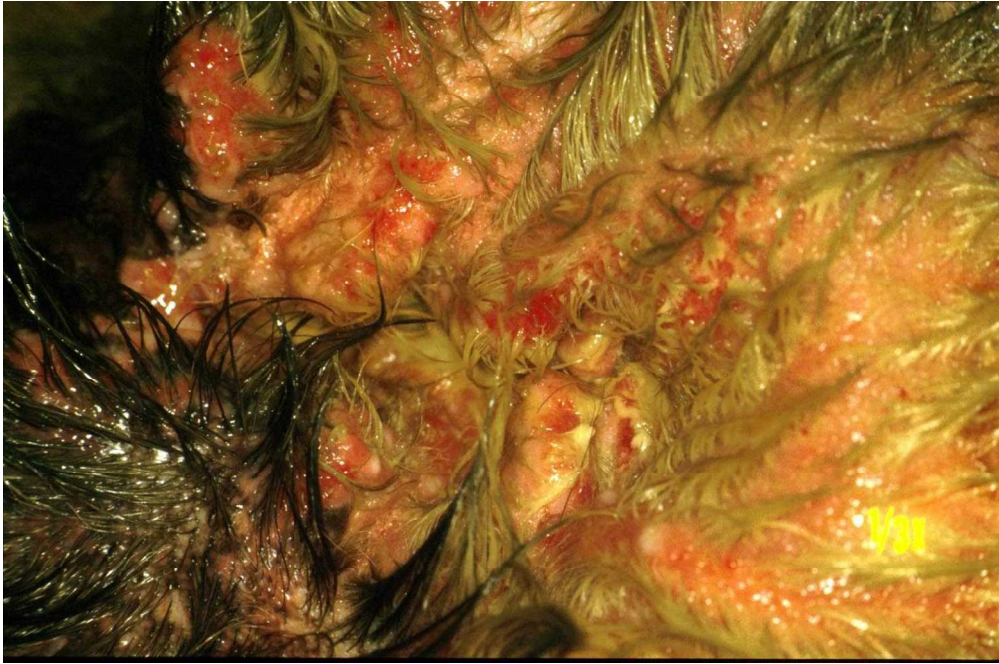
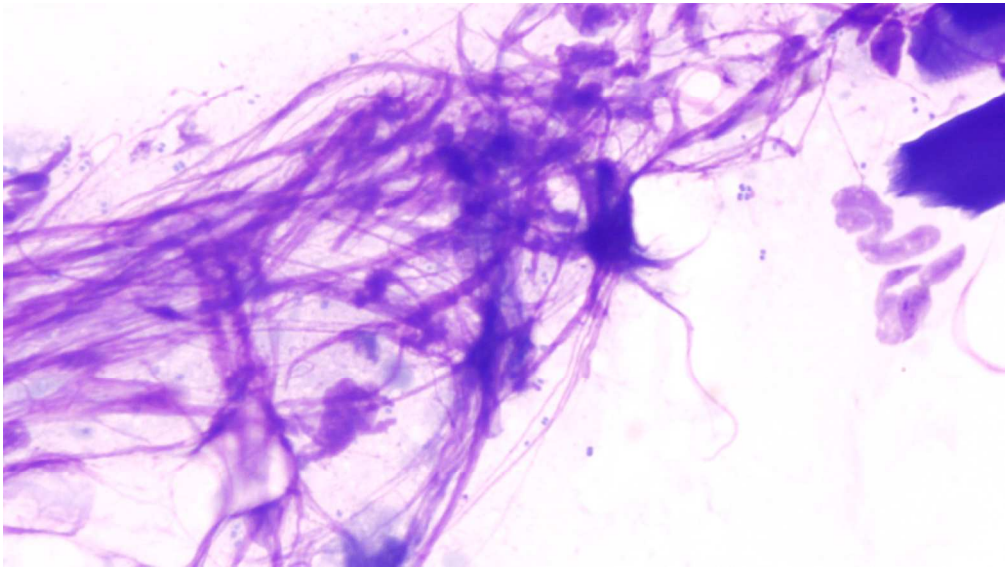


Figure 6

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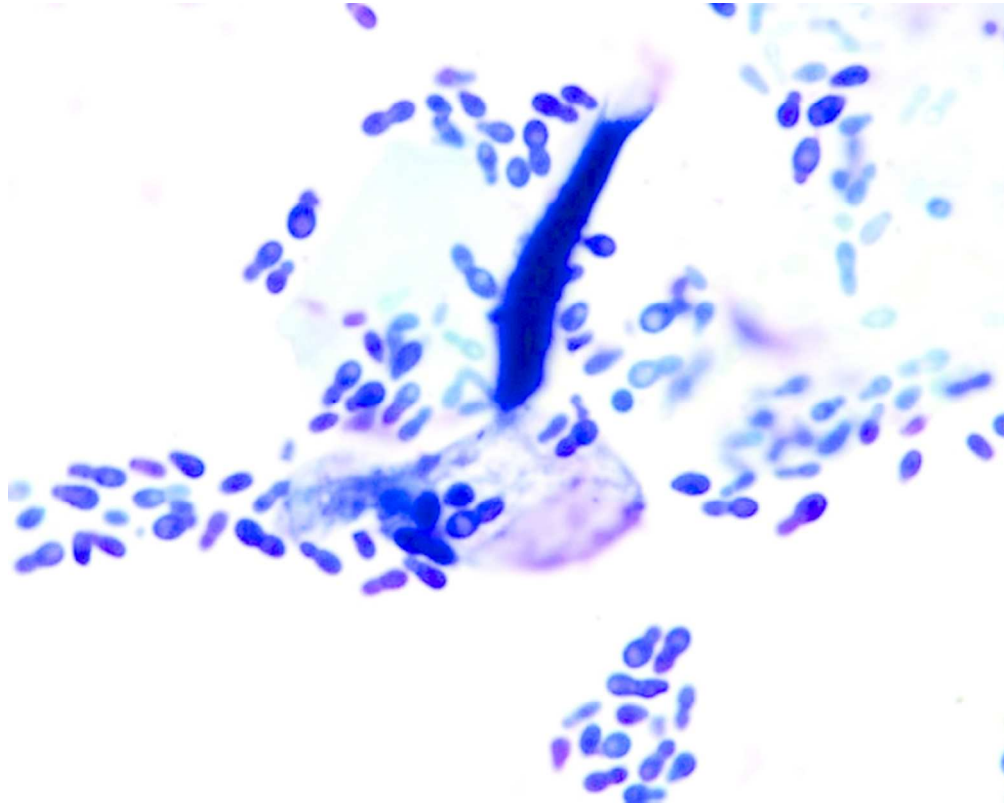
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Ear cytology - cocci

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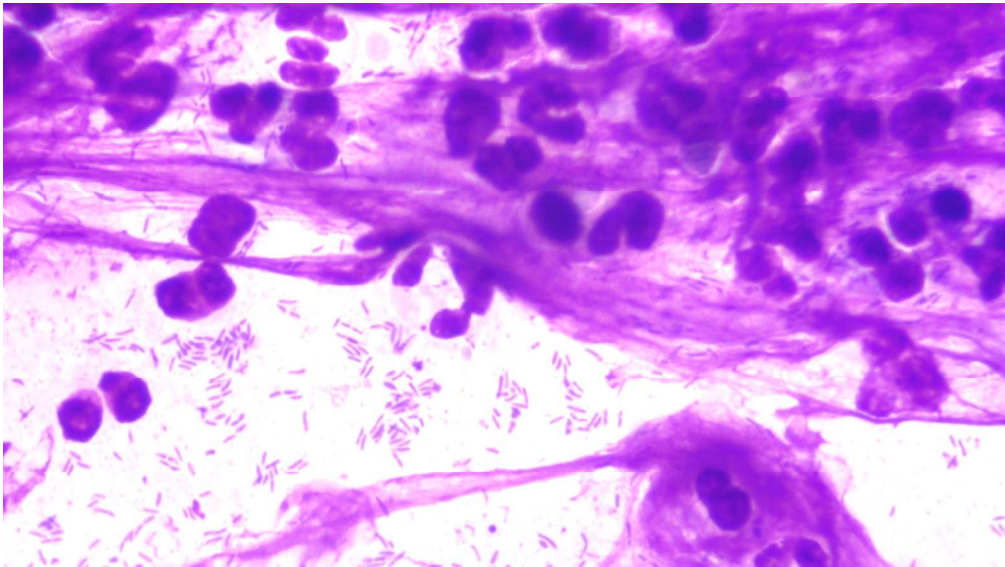


Ear cytology yeast

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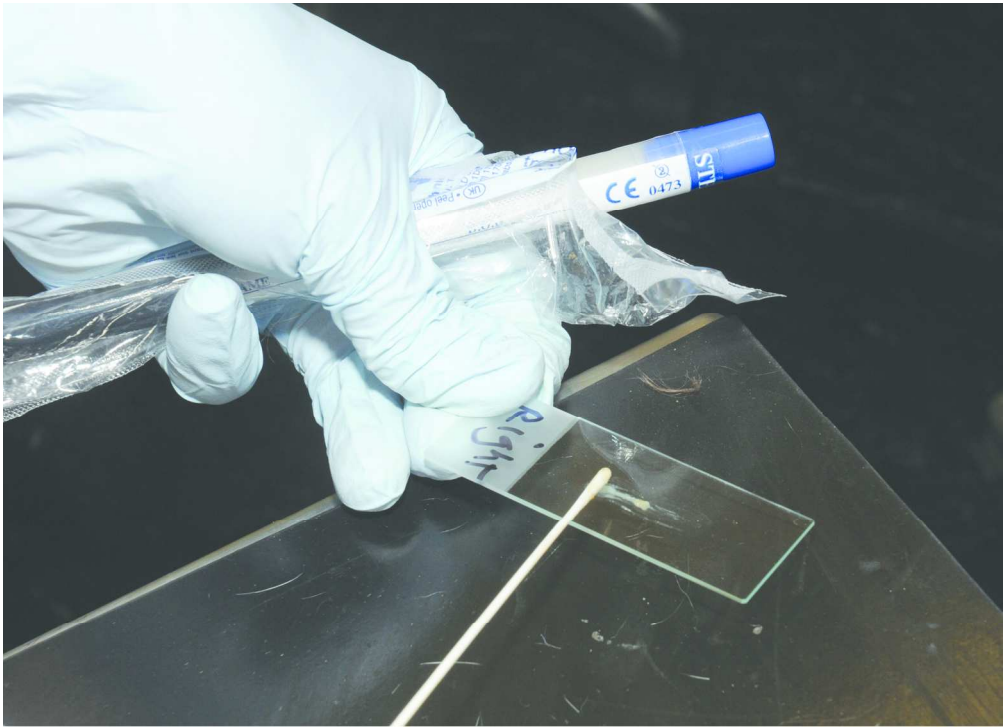
Ear cytology - rods

For Review Only



Ear flush image 1

132x180mm (300 x 300 DPI)



Ear flush image 2

180x129mm (300 x 300 DPI)

Review Only





Ear flush image 3

132x180mm (300 x 300 DPI)



Ear flush image 4

180x124mm (300 x 300 DPI)

Review Only



Ear flush image 5

180x120mm (300 x 300 DPI)